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On the Synaphrid Spider *Cepheia longiseta* (Simon 1881) (Araneae, Synaphridae)

LARA LOPARDO¹ AND GUSTAVO HORMIGA²

ABSTRACT

We redescribe the monotypic spider genus *Cepheia* and provide detailed morphological information on its type species, *Cepheia longiseta*. We provide the first exhaustive diagnosis for the genus, including for the first time detailed information about its external morphology as well as its tracheal system. Some morphological features previously proposed as synapomorphies for the Synaphridae are also present in *Cepheia*, which corroborates some of the diagnostic characters of the family. We also propose new synapomorphies for Synaphridae.

INTRODUCTION

The recently erected araneoid spider family Synaphridae Wunderlich 1986 (Marusik and Lehtinen, 2003; see also Schütt, 2003) groups two genera of minute spiders: (1) *Synaphris* Simon 1894, with eight species described from the Canary Islands, Croatia, Egypt, Spain, Turkmenistan, and Ukraine (Platnick, 2006) and two new species currently being described from Madagascar (Miller, 2007); and (2) the monotypic *Cepheia* Simon 1894 from the west Mediterranean region (France, Italy, Portugal, and Spain) (Platnick, 2006). A third synaphrid

genus is being described as well (Miller, 2007), also from Madagascar. *Cepheia* was created by Simon (1894) within the Theridiidae to include its very unique type species *Theonoe longiseta* Simon 1881. Although *Cepheia longiseta* has been redescribed a few times and has a characteristic male palpal configuration (see below; Simon, 1926; Brignoli, 1970; Thaler and Noflatscher, 1990), no generic or specific diagnoses have been proposed until recently (Marusik and Lehtinen, 2003; Miller, 2007). Also, while the family placement of *Cepheia* in the Mysmenidae has been questioned several times (Brignoli, 1970; Forster and Platnick,

¹ Department of Biological Sciences, The George Washington University, 2023 G St. NW, Washington, D.C. 20052 (laralo@gwu.edu).

² Division of Invertebrate Zoology, American Museum of Natural History; Department of Biological Sciences, The George Washington University, 2023 G St. NW, Washington, D.C. 20052 (hormiga@gwu.edu).

1977; Brignoli, 1980; Wunderlich, 1980; Schütt, 2003; Marusik and Lehtinen, 2003; Lopardo et al., 2007; Miller, 2007), the genus has always been assumed to be closely related to *Synaphris* (Brignoli, 1980; Wunderlich, 1980; Schütt, 2003; Marusik and Lehtinen, 2003; Lopardo et al., 2007; Miller, 2007).

In his original description of *Theonoe longiseta*, Simon (1881) included several somatic features and a few features related to the male palpal configuration, such as the modified palpal tibia, the narrow cymbium, the enormous and compressed bulb, and the conductor. In 1894, Simon created the genus *Cepheia*, and included a short generic description limited to the eye arrangement and the size of the clypeus. Simon (1926) later transferred *Cepheia* from his *Theonoe* to Mysmenae, which was later raised to subfamily rank by Petrunkevich (1928). In a dichotomous key to Mysmenae genera, Simon (1926) provided additional characters that added to the generic/specific descriptions: male palpal bulb as voluminous as the entire cephalothorax; embolus thin and very long, bordering an extremely large transparent piece (i.e., conductor), extending farther than the cymbium. Forster (1959) and Gertsch (1960) independently transferred Mysmeninae from the Theridiidae to the Symphytognathidae s.l., but it was Levi and Levi (1962) who explicitly transferred *Cepheia* (and many other mysmenid genera) again from the Theridiidae to the Symphytognathidae s.l. Brignoli (1970) redescribed *C. longiseta* and added attributes such as legs I and II equally long, very long embolus, fitting the “auriform piece” (i.e., conductor), and bulb with an apophysis. Brignoli is the only author who has mentioned the potential presence of a retrolateral basal paracymbium in the male palp of *C. longiseta* (also coded as “present” in Schütt’s [2003] dataset). Based on the uniqueness of its male palp, Brignoli could not relate *Cepheia* to any other spider genus (Brignoli, 1970: 1412). Other authors later shared this concern. For example, while assigning family rank to the Mysmenidae, Forster and Platnick (1977) questioned the membership of *Cepheia* and *Synaphris* in this family. Subsequently, other authors have also expressed doubts about the inclusion of *Cepheia* and *Synaphris* in Mysmen-

idae (Brignoli, 1980; Wunderlich, 1980). Thaler and Noflatscher (1990) provided the second redescription of *C. longiseta*, presenting further detailed drawings of the female and male genitalia and providing for the first time a detailed and more accurate description of the female genitalic ducts. Marusik and Lehtinen (2003) published the first differential diagnosis for *C. longiseta*, although their work was based on data published in previous studies, as they did not examine specimens. The only diagnostic feature that they proposed was the narrow cymbium (Marusik and Lehtinen, 2003: 151). Marusik and Lehtinen (2003: 151) also placed *Cepheia* as provisional in their recently erected Synaphridae, “because no ultrastructural characters of *Cepheia* have been studied”. In a recent discussion of *Synaphris* and synaphrid potential synapomorphies, Lopardo et al. (2007) documented the spinneret spigot morphology of *Cepheia longiseta* for the first time, and they briefly discussed its inclusion within Synaphridae. No other detailed morphological study has ever been done for the genus.

We herein provide a taxonomic description of *Cepheia longiseta*, including detailed information about its external morphology as well as its tracheal system, and a more comprehensive diagnosis for the genus. We base our redescription on type material and specimens used in previous redescrptions. We also discuss some of the morphological features shared with *Synaphris* that could further support the recently proposed potential synapomorphies for Synaphridae (Lopardo et al., 2007; Miller, 2007).

MATERIALS AND METHODS

Methods of study follow Hormiga (2003). Specimens were studied in 80% ethanol using a Leica MZAPO stereomicroscope. For observation of respiratory structures, the abdomens of two specimens were bisected horizontally and digested with SIGMA Pancreatin LP 1750 enzyme complex, in a solution of sodium borate prepared following the concentrations described by Dingerkus and Uhler (1977) as modified in Alvarez Padilla and Hormiga (in press). The bisected abdomen was left in this solution overnight at room temperature. After the enzymatic digestion the specimens were

transferred to distilled water for observation. All measurements are in millimeters. Carapace height was measured at the highest point, from the carapace lateral edge, not from the sternum. Abdominal measurements are the largest. To account for length variations, measurements are expressed first as the length of the described specimen, then as the range of some of the observed specimens (in parentheses). After dissection, male palps and female epigyna were cleared in clove oil. Genitalic drawings were made with a camera lucida attached to a Leica DMRM compound microscope. For SEM study, the specimens were critical-point dried and sputter-coated with gold-palladium. Images were taken with a LEO 1430VP microscope at the Department of Biological Sciences (George Washington University) SEM facility. Species descriptions and measurements follow Lopardo et al. (2007). Leg formula refers to the relative length of legs. Two legs are considered equally long when their range of variation overlaps, even if their averages are slightly different. We follow Lopardo et al. (2007) for nomenclature of palpal sclerites. Studied specimens were made available by the Muséum National d'Histoire Naturelle (MNHN, Paris, France) and by the Naturhistorisches Museum (NMW, Vienna, Austria). For abbreviations used through figures and text see appendix 1.

RESULTS

Cepheia Simon 1894

Cepheia Simon 1894: 589. Type species by original designation and monotypy: *Theonoe longiseta* Simon 1881: 132.

Cepheia, Simon, 1926: 312, 314–315; Brignoli, 1970: 1410–1412; Forster and Platnick, 1977: 2; Brignoli, 1980: 730; Wunderlich, 1980: 266; Thaler, 1993: 99; Marusik and Lehtinen, 2003: 151; Schütt, 2003: 134, 137.

DIAGNOSIS: *Cepheia* can be distinguished from other synaphrid genera by the following combination of features: carapace rounded, as long as wide, with the clypeal area protruding in dorsal view (figs. 3, 4, 9); tarsal organ flat (figs. 26, 27); two AC gland spigots on PMS (figs. 34, 35); one CY spigot in females on PLS (fig. 36); one (possibly chemosensory) seta in both sexes located on the side of distal PLS segment (figs. 36, 37); male palp enormous (in

lateral view, almost as large as prosoma, fig. 2), compressed (figs. 2, 6, 44, 47); cymbium long and narrow (figs. 46–49), with tarsal organ distal, flat, opening teardrop-shaped (fig. 54); small membranous cuticular protuberances interspersed on distal area of conductor (figs. 2, 42, 50); one dorsal tegular pointed apophysis (figs. 39, 45, 49); female copulatory ducts initially coiled posteriorly in one loop (fig. 40), then wrapping around spermathecae in four loops (figs. 40, 41, 59), and epigynum slightly sclerotized, with a medial depression bearing the copulatory openings (fig. 57).

NATURAL HISTORY: *Cepheia longiseta* has been collected from coastal dry regions and near the shore, for example, in dry grasses (Simon, 1926); 100 m of the sea beach, under *Ammophila* (Wunderlich, 1980); and in dry hillsides of prevailing porphyry rocks habitats, dry lawns, and seam areas (Thaler and Noflatscher, 1990). No information is available on its web architecture.

DISTRIBUTION: *Cepheia longiseta*: West Mediterranean Region: southern France (Simon, 1881, 1894, 1926; Denis, 1933a; Brignoli, 1970), northern Italy (Bertkau, 1890; Thaler and Noflatscher, 1990), southern Spain (Wunderlich, 1980; Thaler and Noflatscher, 1990; Lopardo et al., 2007), southern Austria (Thaler, 1993), southern Portugal, and the Balears Islands (Lopardo et al., 2007) (see geographic distribution map in Lopardo et al., 2007, fig. 1).

Cepheia longiseta (Simon 1881)

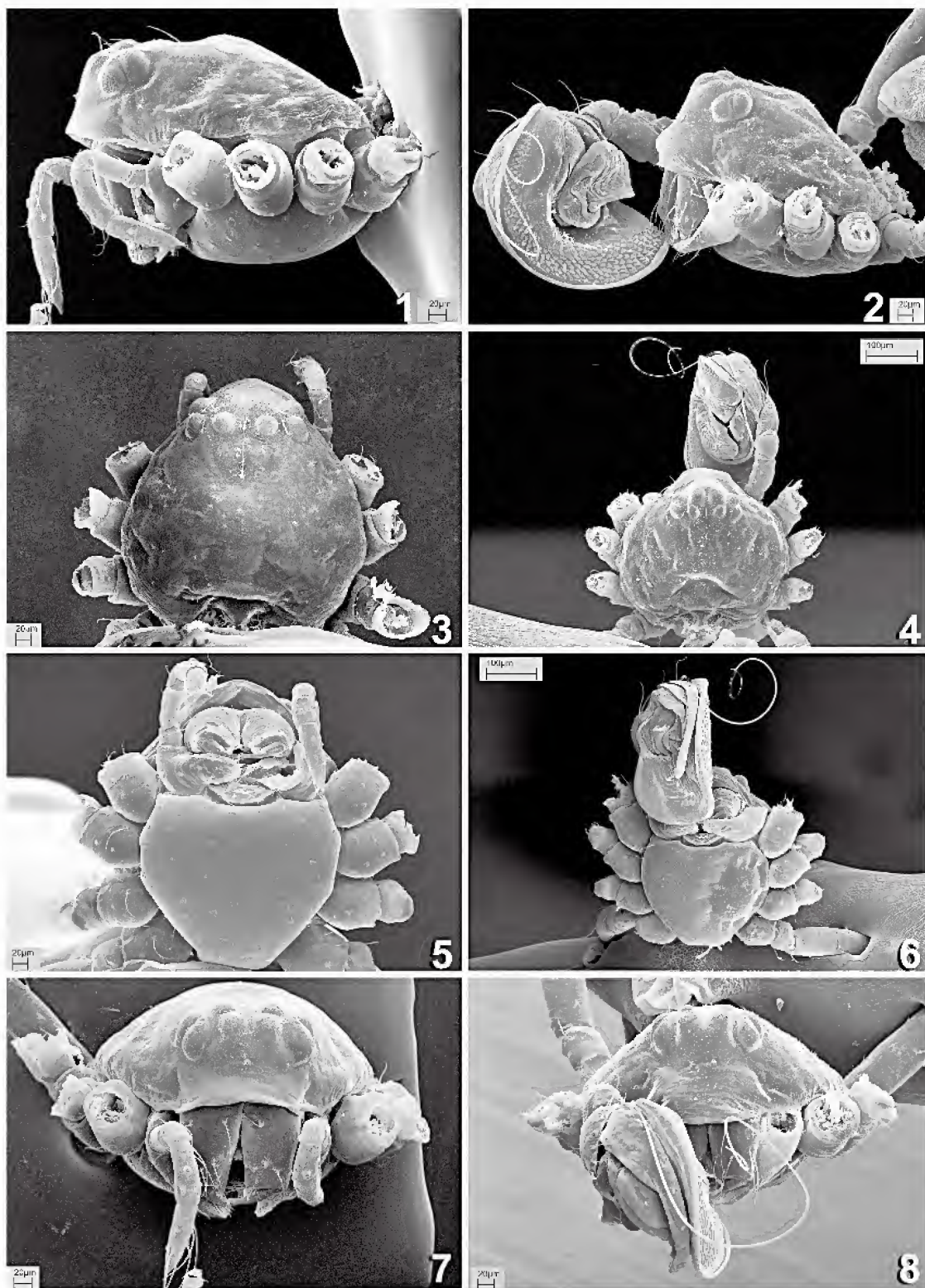
figures 1–63

Theonoe longiseta Simon 1881: 132–133, table 26, fig. 1.

Theonoe longiseta, Bertkau, 1890: 10.

Cepheia longiseta, Simon, 1894: 589; Simon, 1926: 313–315; Denis, 1933a: 564; Denis, 1933b: 93; Levi and Levi, 1962: 18, 64, figs. 309–310; Brignoli, 1970: 1410–1412, figs. 11–14; Wunderlich, 1980: 267, figs. 17, 42–43; Thaler and Noflatscher, 1990: 173–174, figs. 25–29; Heimer and Nentwig, 1991: 306, fig. 823; Marusik and Lehtinen, 2003: 151; Lopardo et al., 2007: 9–11.

TYPES: One male lectotype and 14♀ 17♂ and 3 juvs paralectotypes from FRANCE (“Gallia”) coll. Simon 4538, b.849 (in MNHN-AR 1059, examined). The label, rewritten by P.M. Brignoli, also includes “1969,



Figs. 1–8. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). 1, 3, 5, 7, Female cephalothorax. 2, 4, 6, 8, Male cephalothorax. 1, 2, Lateral view; 3, 4, dorsal view; 5, 6, ventral view; 7, 8, frontal view.

PM Brignoli leg.”, which should be read as “det. P.M. Brignoli 1969”.

TYPE LOCALITY: “France: Dept. du Var, Vallée de Dardennes near Toulon; pierrefeuf dans la forêt de Maures” (Simon, 1881:133).

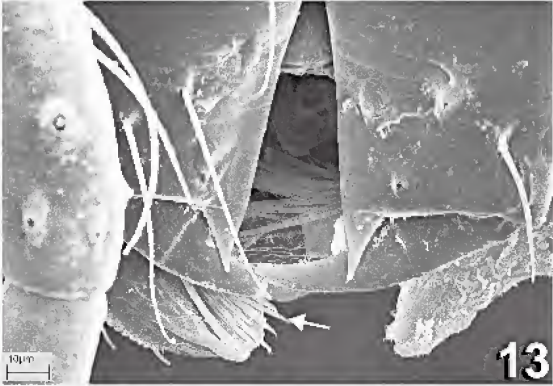
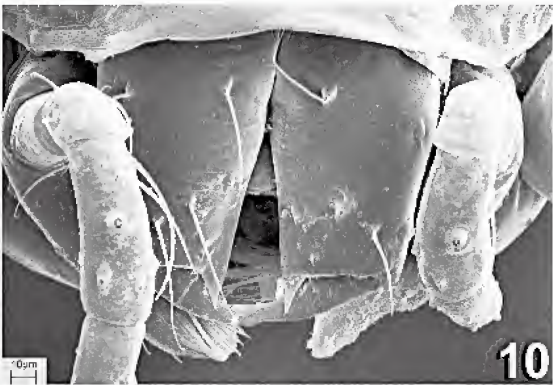
DIAGNOSIS: See generic diagnosis.

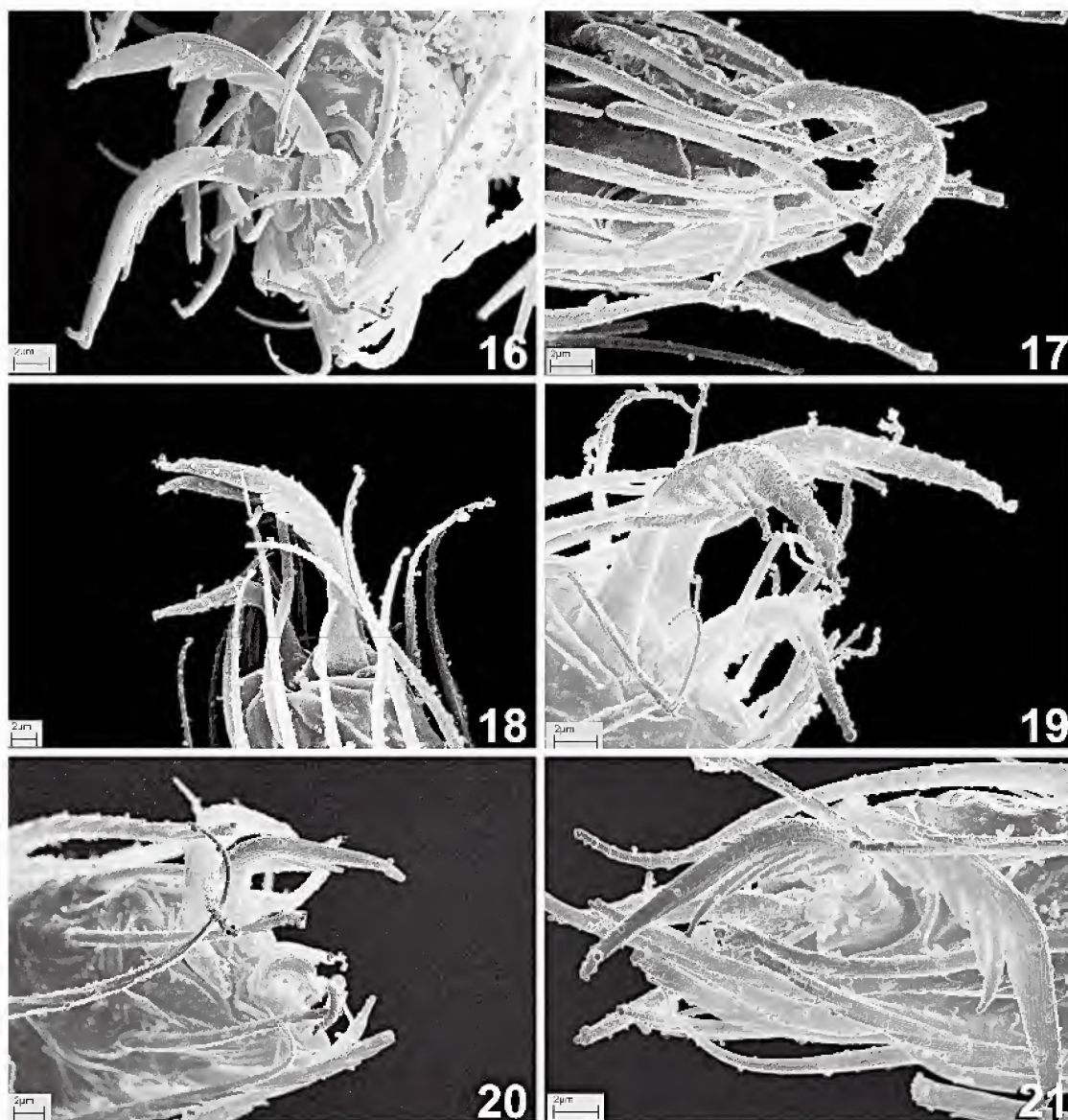
DESCRIPTION: Dorsal carapace with three setae along midline and four laterally, two on each side (figs. 3, 4, 7, 8). Midline setae slightly posterior to PME (one), and on dorsalmost carapace surface (two). Lateral setae located behind ALE (one pair) and PLE (one pair). Carapace rounded (as long as wide), with clypeal area protruding in dorsal view (figs. 3, 4, 9). Chelicerae with median keel ending in single strong promarginal tooth (figs. 10, 11, 13, 15); retromarginal teeth absent. Maxillary setae scarce, distal maxillary setae clavate (arrow in fig. 13). Clypeus slightly convex. Sternum cuticle squamate, posterior margin truncated, wide, about twice width of coxa IV (figs. 5, 6). *Legs*: Femoral spot absent. Setae on legs with large elevated, striated bases (figs. 22, 25, 26), weaker on chelicerae (fig. 10). Leg tarsi without pseudo-segmentation (fig. 24). Tarsal-metatarsal joint constricted, distal area of metatarsi with dorsal lyriform organ as band of anastomosed ridges (figs. 22, 23). Legs without spines, tarsal organ located in basal third dorsal region of tarsus, capsulate, flat, opening rounded, difficult to see (figs. 26, 27). Three tarsal claws, serrate accessory setae (or false claw) present (fig. 17). Claw teeth (paired claws/inferior claw): leg I, paired claws with five teeth (fig. 16)/inferior claw with two teeth and one dorsal denticle (fig. 17); leg II, five teeth/two teeth (fig. 18); leg III, four teeth/two teeth (figs. 20, 21); leg IV, four teeth/two teeth and one dorsal denticle (fig. 19). Leg setae serrate. Cuticular surface of appendages squamate (figs. 23, 25, 26). Tarsi and metatarsi equally long (fig. 23; see tables 1 and 2). *Trichobothria*: Trichobothrial bases simple and smooth, with proximal hood bearing two lateral ridges, similar on all legs and segments (fig. 25). Tarsal trichobothria absent. Legs I and II, tibia 2-r1-0; metatarsus r1-0. Legs III and IV, tibia 2-2-0; metatarsal trichobothria absent. *Color*: Carapace yellow, few darker radii, center and margins brown (fig. 9); sternum dark brown, homogeneous. Legs yellowish,

darker on tibiae, patellae, distal femora, and distal tarsi. Abdomen dark brown. *Eyes*: All eyes pearly white except AME, black. Diameter: AME 0.03, PME 0.02, PLE 0.03, ALE 0.03. *Respiratory system*: Anterior book-lungs reduced to tracheae (figs. 58, 59), connected by a transverse duct (arrow in fig. 59).³ Anterior spiracles connected to epigastric furrow (fig. 56). Five tracheal tubes arise from each anterior spiracle, four oriented anteriorly toward cephalothorax, one oriented laterally (figs. 59, 60). Posterior tracheal system with two distant spiracular openings exteriorly connected by thin ridge (i.e., one wide spiracular opening) (figs. 30, 31). Thin ridge leading to deep, flat, membranous atrium, anteriorly ending in sclerotized U-shaped duct that connects the tracheal ducts arising from spiracles (fig. 62). Two main tracheal bundles arise from the junction of tracheal ducts and U-shaped atrial duct, one on each side, directing tracheoles mainly anteriorly (figs. 62, 63). Both tracheal systems seem to reach into prosoma. This tracheal arrangement is similar to that described for *Synaphris* (Lopardo et al., 2007; see schematic drawing in their figure 30).

MALE (range of four measured paralecto-types): Total length 0.84 (0.83–0.85). Carapace length 0.34 (0.34–0.37), width 0.36 (0.36–0.37), height 0.16 (0.16–0.17). Labrum with three minute, long chemosensory setae (fig. 11). Clypeus height 0.12, ca. 4 AME diameters. Two setae located on clypeus (fig. 8). Sternum length 0.25 (0.25–0.26), width 0.27 (0.26–0.27), length/width 0.91 (0.91–0.98). Abdomen oval (figs. 9, 14), length 0.50 (0.50–0.51), width 0.43 (0.43–0.47), height 0.42 (0.42–0.48). Two epiandrous spigots centrally distributed along the epigastric furrow (fig. 55). *Legs*: Leg formula 1=4=23. Leg measurements: see table 1. Leg I prolateral clasping spine absent. *Spinnerets* (fig. 31, see also Lopardo et al., 2007): Colulus large, fleshy, triangular, about half length and width of ALS, with three setae

³The term “transverse duct” had generated some confusion in the past and seems in need of a proper illustration (Martín J. Ramírez, personal commun.; for discussion see Ramírez [2000] and references therein). Here we provide with images of the “transverse duct”, in this case connecting the anterior tracheae (arrow in fig. 59).

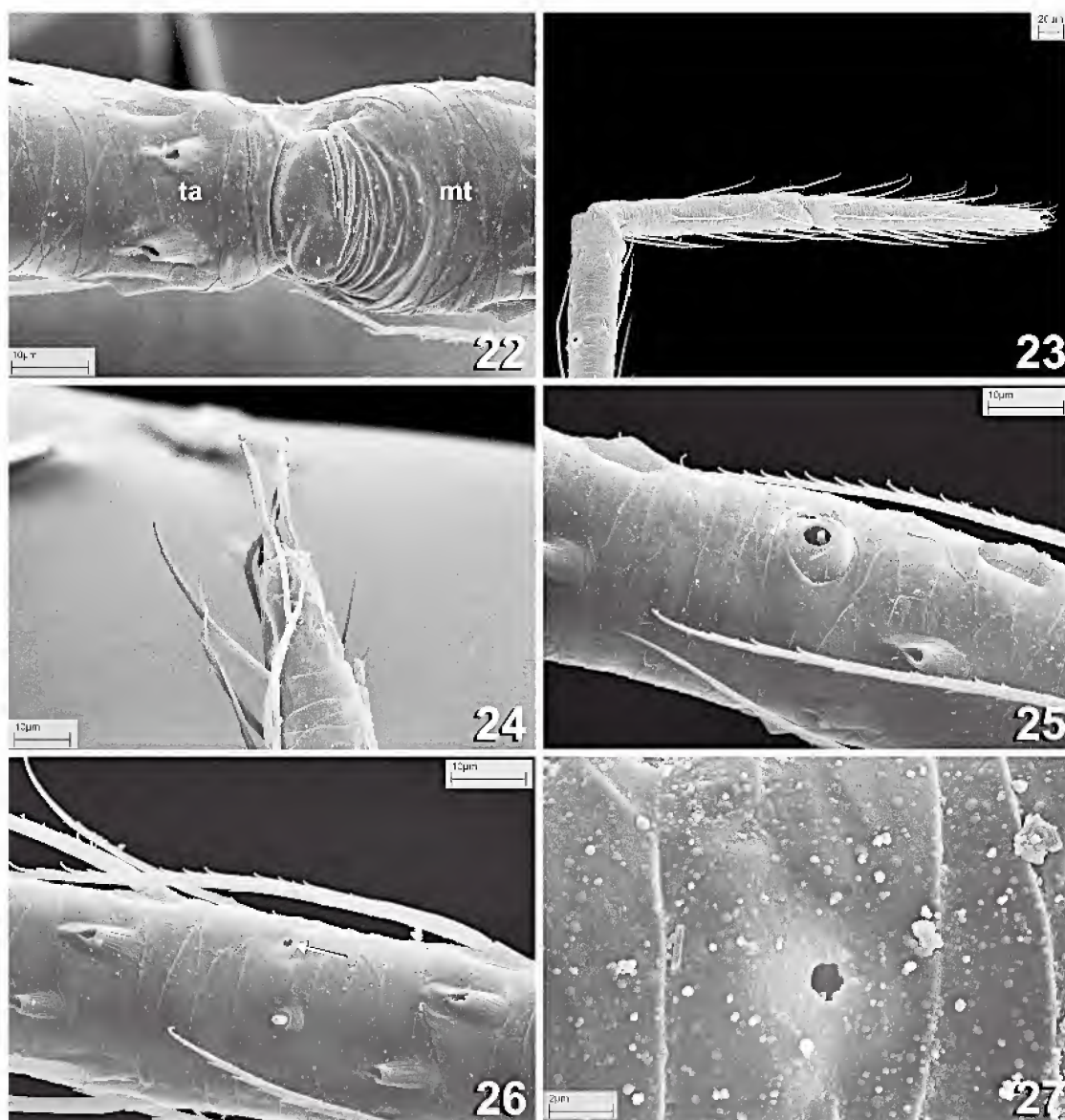




Figs. 16–21. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). Tarsal claws. 16, Right leg I, male (inferior and prolateral paired claws broken); 17, right leg I, female (retrolateral paired claw broken); 18, right leg II, female; 19, right leg IV, male; 20, right leg III, male (inferior and retrolateral paired claws broken) (inferior claw broken); 21, same.

←

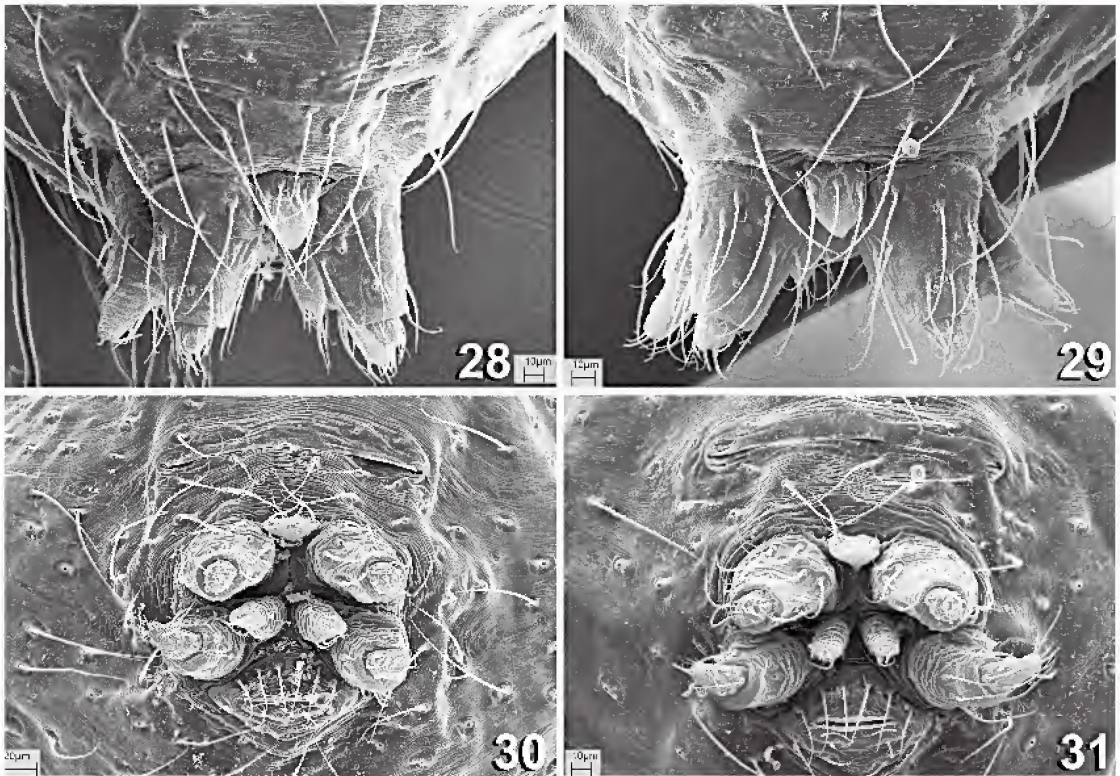
Figs. 9–15. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059) (except fig. 9). 9, Male habitus, dorsal view (NMW-14994), scale bar: 0.5 mm; 10, chelicerae, female, frontal view; 11, cheliceral keel, male, frontal view; 12, detail of female palpal tip, showing absence of claw; 13, detail of figure 10, female, ventral view, arrow to clavate setae; 14, male abdomen, ventral view; 15, mouthparts, female, ventral-lateral view.



Figs. 22–27. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). **22**, Right leg I, female, tarsus-metatarsus joint, dorsal view; **23**, right leg III, male, tarsus and metatarsus, retrolateral view; **24**, right leg IV, female, tarsal tip, showing no pseudosegmentation, dorsal view; **25**, right leg I, female, metatarsus, trichobothrial base, dorsal view; **26**, tarsus, dorsal view, arrow to tarsal organ; **27**, same, detail of tarsal organ. Abbreviations: mt, metatarsus; ta, tarsus.

(figs. 29, 31). ALS (fig. 33) with one MAP spigot, accompanied by a nubbin and a tartipore, separated by weak (almost nonexistent) furrow from PI field. PI field, on external side of ALS, contains three PI spigots with reduced bases, posterior PI spigot base larger. PMS

(fig. 35) with two AC spigots, one chemosensory seta (can be confused with a spigot) located anteriorly, its base deepens around shaft. PLS (fig. 37) with two spigots of slightly different morphology, clumped in same field. Internal one with rounded, larger base and more



Figs. 28–31. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). Spinning fields. **28**, Female, ventral view; **29**, male, ventral; **30**, female, posterior view; **31**, male, posterior view.

cylindrical shaft, external one with oval base and tapering shaft. Short thick chemosensory seta (can be confused with a small spigot), located more basally on internal side of distal PLS segment. *Palp* (figs. 38, 39, 42–54): Enormous, compressed (figs. 2, 6, 8). Tibia rounded retrolaterally, without apophyses, pressed toward the bulb retrolaterally (figs. 8, 46, 47, 52). One tibial trichobothrium located dorsal and distally, close to cymbial base (figs. 46, 47). Cymbium long, narrow, thicker at base, then equally narrow, dorsal (figs. 44–49, 53, 54). Tarsal organ dorsal, distal, capsulated, flat, opening teardrop-shaped (fig. 54). Basal retrolateral margin of cymbium with triangular paracymbium (figs. 39, 46, 47, 53). Embolus filiform, long (figs. 42–44, 47). Embolar base irregular, retrolateral, ventrally located, membranous, without expansions (figs. 38, 42, 51). Embolus running clockwise (in left palp) on retrolateral side of bulb, passing to and ending on prolateral side, distally, within

conductor groove (figs. 38, 39, 50). Huge membranous conductor occupying most of retrolateral and distal half of prolateral bulb, with groove where embolus fits (figs. 42–46). Small cuticular protuberances interspersed on distal area of conductor (fig. 50). Conductor with prolateral pointed apophysis where groove ends (figs. 39, 45–47, 52). One dorsal tegular apophysis, close to cymbium, pointed (figs. 39, 45, 49). Spermatic duct seems to undergo two transverse loops before reaching embolar base (fig. 38). Diameter of spermatic duct gradually increases before entering base of embolus for fraction of loop length, returning to smaller diameter before entering embolus (arrow in fig. 38).

FEMALE (range of nine measured paralectotypes): Total length 0.90 (0.85–0.96). Carapace length 0.36 (0.35–0.38), width 0.35 (0.33–0.37), height 0.16 (0.14–0.19). Clypeus height 0.11 (0.09–0.12), ca. 4.25 (3–5) AME diameters. One seta located on clypeus along

TABLE 1
Length of Right Leg for Four Male Paralectotypes (MNHN-AR 1059) of *Cepheia longiseta* (Simon 1881)
Measurements are in millimeters, ranges in parentheses.

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Leg I	0.32 (0.32–0.33)	0.12	0.25 (0.25–0.27)	0.21 (0.21–0.22)	0.22	1.13 (1.13–1.17)
Leg II	0.32 (0.32–0.33)	0.12	0.24 (0.24–0.25)	0.22 (0.20–0.22)	0.22	1.12 (1.12–1.13)
Leg III	0.31 (0.28–0.31)	0.11 (0.11–0.12)	0.22 (0.19–0.23)	0.20 (0.19–0.20)	0.20	1.05 (0.99–1.05)
Leg IV	0.34 (0.33–0.34)	0.12	0.25	0.22 (0.19–0.22)	0.22	1.15 (1.12–1.15)

TABLE 2
Length of Right Leg for Nine Female Paralectotypes (MNHN-AR 1059) of *Cepheia longiseta* (Simon 1881)
Measurements are in millimeters, ranges in parentheses.

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Leg I	0.33 (0.33–0.35)	0.12 (0.11–0.14)	0.24 (0.22–0.25)	0.20 (0.20–0.22)	0.22 (0.20–0.24)	1.10 (1.09–1.17)
Leg II	0.33 (0.31–0.34)	0.09 (0.09–0.13)	0.22 (0.20–0.24)	0.20 (0.20–0.22)	0.22 (0.22–0.24)	1.07 (1.07–1.14)
Leg III	0.31 (0.30–0.33)	0.09 (0.09–0.12)	0.19 (0.16–0.22)	0.19 (0.19–0.21)	0.20 (0.19–0.22)	0.98 (0.98–1.06)
Leg IV	0.35 (0.34–0.36)	0.10 (0.10–0.13)	0.25 (0.24–0.28)	0.22 (0.21–0.22)	0.20 (0.20–0.24)	1.13 (1.13–1.22)

midline (fig. 7). Sternum length 0.23 (0.23–0.27), width 0.24 (0.24–0.28), length/width 0.95 (0.87–1.02). Palp without claw (figs. 1, 12). Abdomen oval, length 0.60 (0.57–0.66), width 0.52 (0.47–0.56), height 0.51 (0.45–0.55). *Legs*: Leg formula 4=1=23. Leg measurements: see table 2. *Spinnerets* (fig. 30, see also Lopardo et al., 2007): Colulus large, fleshy, triangular, about half length and width of ALS, with four setae (figs. 28, 30). Spinnerets as in male, except: three PI spigots (instead of two) on ALS (fig. 32); one external (ectal) CY spigot on PMS (fig. 34); one internal (mesal) CY on PLS (fig. 36). *Epigynum* (figs. 40, 41, 56–59, 61): Slightly sclerotized, translucent, with medial depression bearing copulatory openings (figs. 56, 57). Copulatory ducts initially coiled posteriorly in one loop (fig. 40), then directing anterior and dorsally, then wrapped around spermathecae in four loops (figs. 40, 41, 59). Spermathecae cylindrical (figs. 59, 61). Fertilization ducts slightly coiled, arising at dorsal edge of spermathecae (figs. 41, 61).

NATURAL HISTORY: See generic natural history.

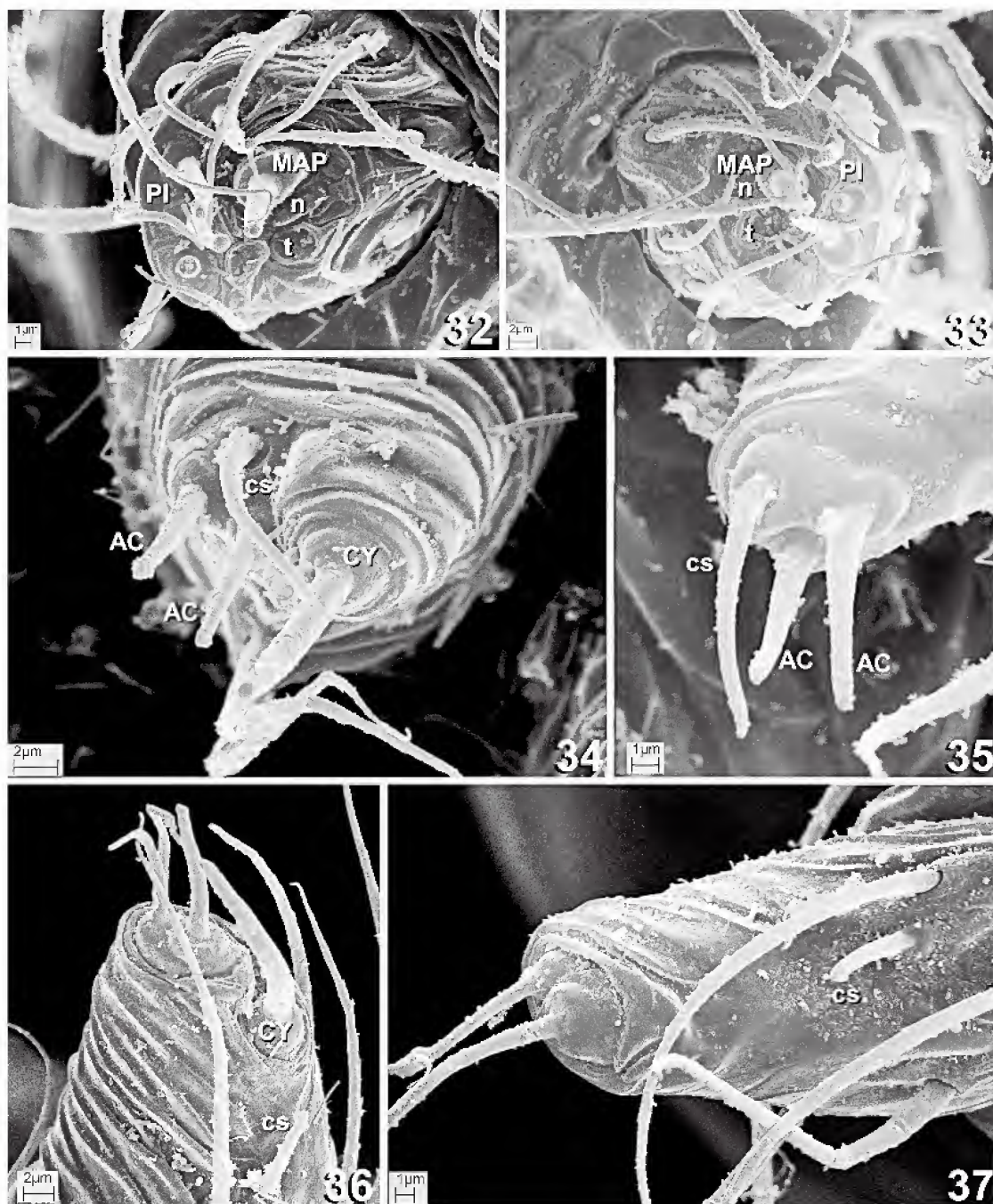
DISTRIBUTION: See generic distribution.

OTHER MATERIAL EXAMINED: No locality data, no collector, 1 ♂ (MNHN-AR 1063)⁴; FRANCE: Banyuls, no date, no collector, 1 ♂ 1 sub ♂ (MNHN-AR 1070); ITALY: South Tirol, Bolzano Province, Bolzano/Guntschna, 470 m, 27.vi.1988, Noflatscher, 2 ♀ 1 ♂ (NMW-14994).

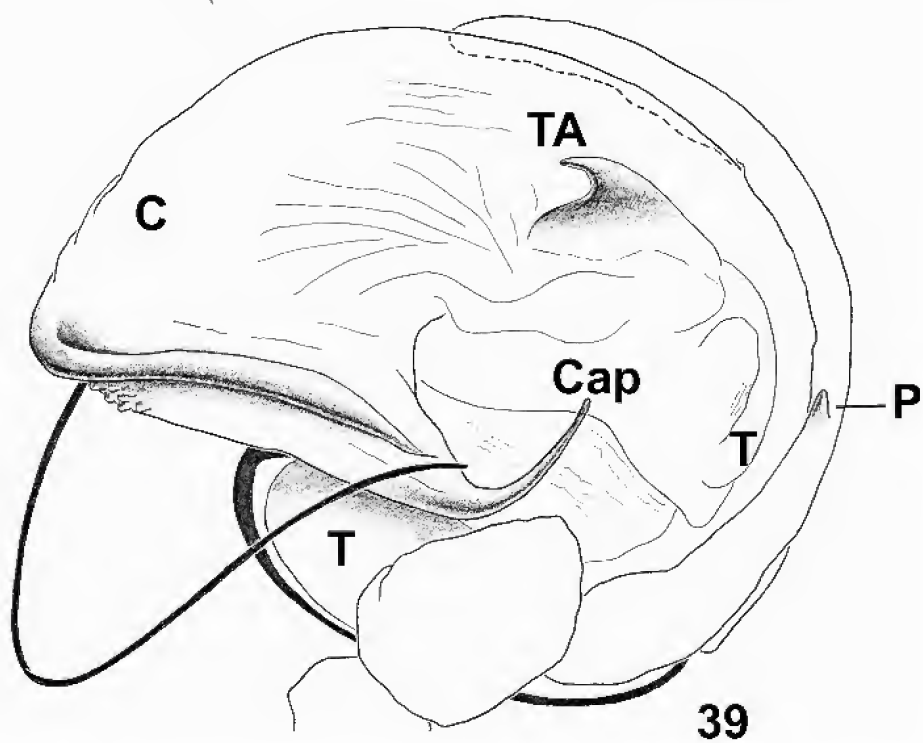
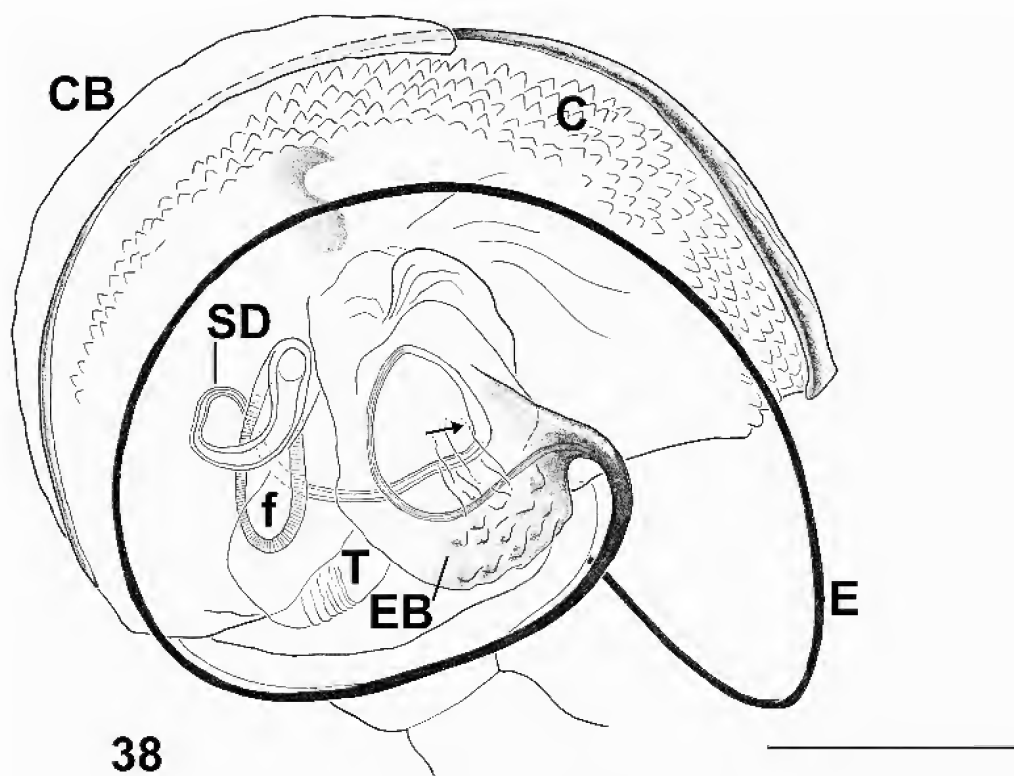
DISCUSSION

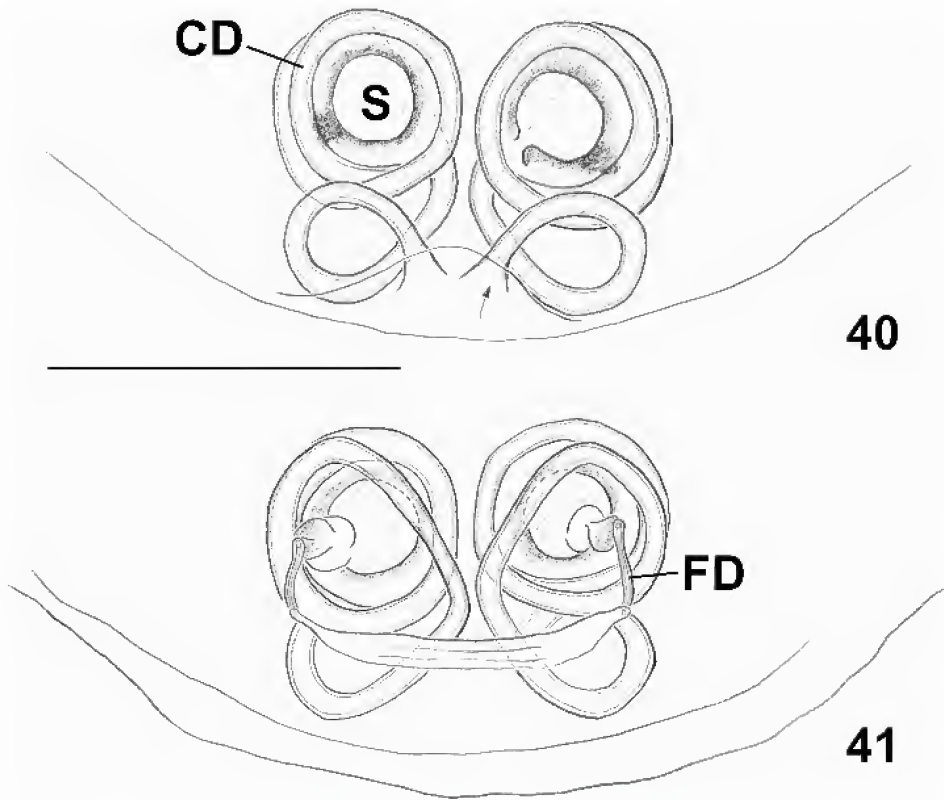
In their discussion of morphological features and their potential synapomorphic value for the Synaphridae, Lopardo et al. (2007)

⁴A third vial from the MNHN labeled “ALGERIA: Edough, Bone, 1008, E Simon (MNHN-AR1063)”, supposedly containing the male holotype and only specimen of *Calodipoena conica* (Simon 1895) (Mysmenidae), was found to contain one male of *Cepheia longiseta* instead (examined here). Brignoli already noticed and stated this specimen misplacement in a letter to the Paris Museum curator in 1968 (Elise-Anne Leguin, personal commun.) and in his redescription of *C. longiseta* (Brignoli, 1970: 1411). Still, he redescribed *Calodipoena conica* in the same article (Brignoli, 1970: 1404). Rowley Snazell (personal commun.) examined the MNHN collection in 1983 and found this same circumstance. Therefore, as the situation seems to remain unchanged, we suspect the holotype of *Calodipoena conica* has been either misplaced or lost.



Figs. 32–37. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). Spinnerets. 32, 33, Anterior lateral spinnerets. 32, Female, right ALS; 33, male, left ALS; 34, 35, Posterior median spinnerets. 34, Female, left PMS; 35, male, right PMS; 36, 37, Posterior lateral spinnerets. 36, Female, left PLS; 37, male, right PLS. Abbreviations: AC, aciniform gland spigot; AG, aggregate gland spigot; CY, cylindrical gland spigot; FL, flagelliform gland spigot; MAP, major ampullate gland spigot; n, nubbin; PI, piriform gland spigot; t, tartipore.





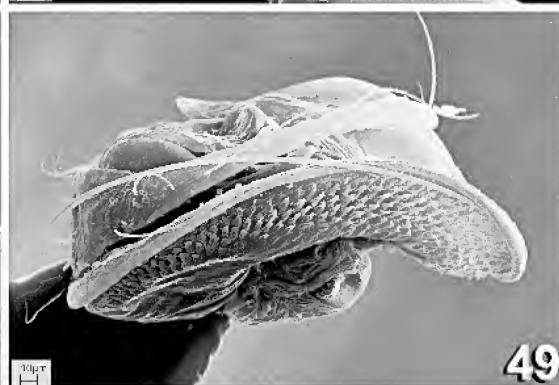
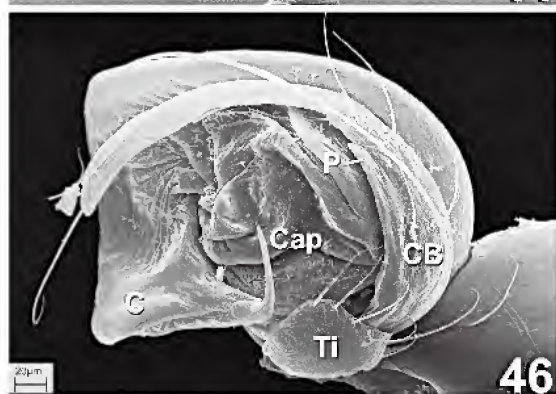
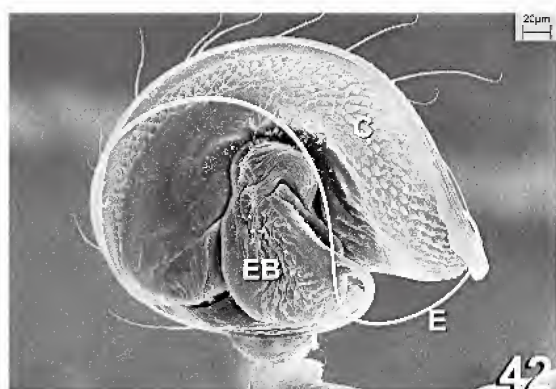
Figs. 40, 41. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). Epigynum, cleared. **40**, Ventral view; **41**, dorsal view. Scale bar: 0.1 mm. Abbreviations: CD, copulatory duct; FD, fertilization duct; S, spermatheca.

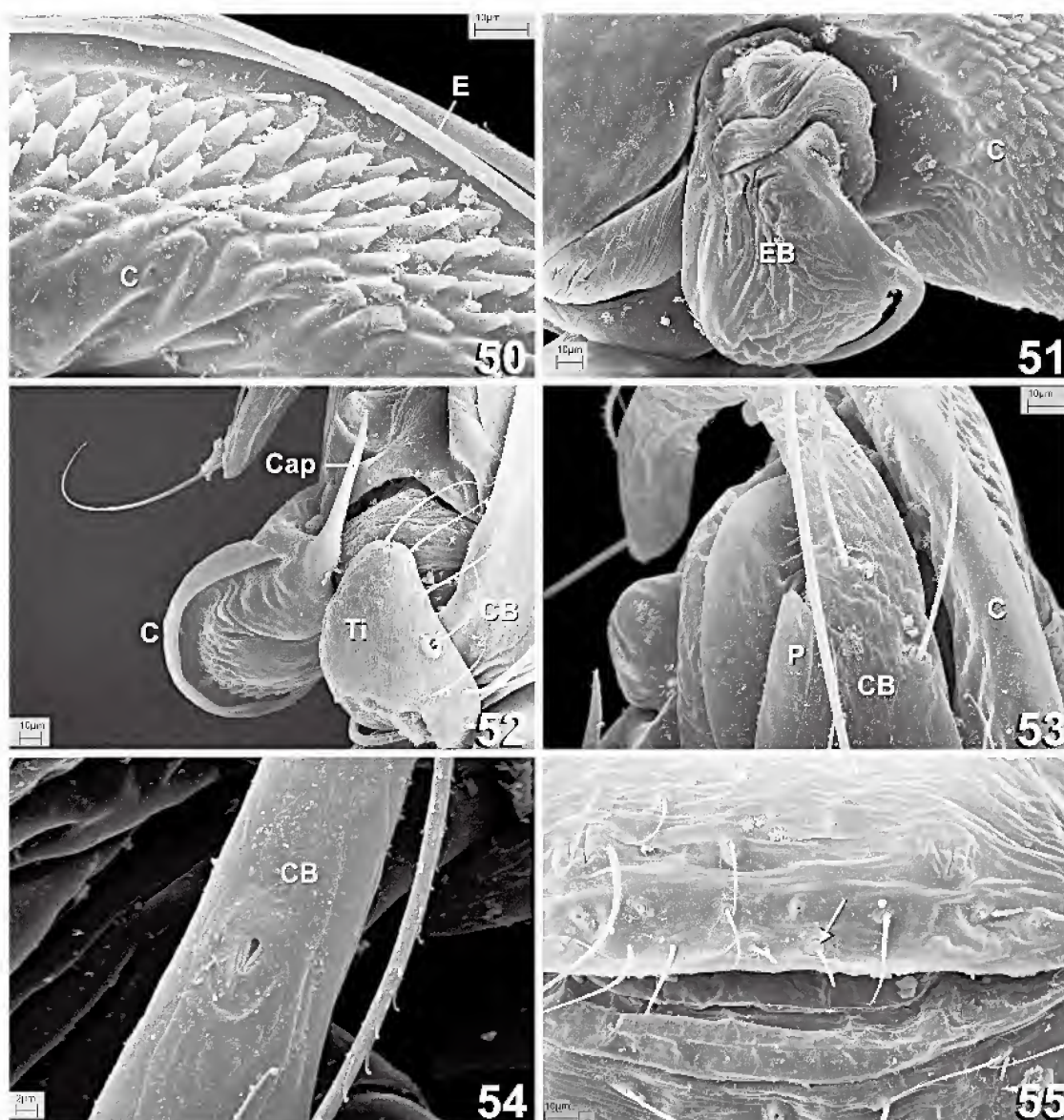
suggested putative synapomorphies for *Synaphris* and/or Synaphridae. *Cepheia longiseta* also presents several of the proposed synapomorphies for *Synaphris*, providing additional support for the hypothesis that the family Synaphridae is a natural group. These synapomorphies include: the distinct constriction on the tarsi-metatarsi joint (fig. 22); the cheliceral keel ending in a strong promarginal cheliceral tooth (figs. 11, 15); the scarce number of maxillary setae (figs. 10, 11, 13, 15) and the clavate distal maxillary setae (arrow in fig. 13); the distinctive tibial morphology (rounded retrolaterally and pressed

against the cymbial base; figs. 46, 47), and the retrolateral basal paracymbium (figs. 39, 46, 47, 53). However, the typical cymbium of *Synaphris* divided into two separate areas (a sclerotized one bearing setae, and a glabrous membranous one) is very different from the cymbium of *Cepheia* (which is very narrow and lacks a second membranous area; figs. 47, 48). Also, the palpal dorsal translucent expansion of the embolar base (embolic “lamella”) is absent in *Cepheia* as well, and it seems to be autapomorphic for *Synaphris* or at least a clade within it. The notched tibial trichobothrial base, the tarsal pseudosegmentation,

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Figs. 38, 39. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). Male, left palp. **38**, Prolateral view, arrow to diameter increase on spermatic duct; **39**, retrolateral view. Scale bar: 0.1 mm. Abbreviations: C, conductor; Cap, apophysis of conductor; CB, cymbium; E, embolus; EB, embolar base; f, fundus; P, paracymbium; SD, spermatic duct; T, tegulum; TA, tegular apophysis.

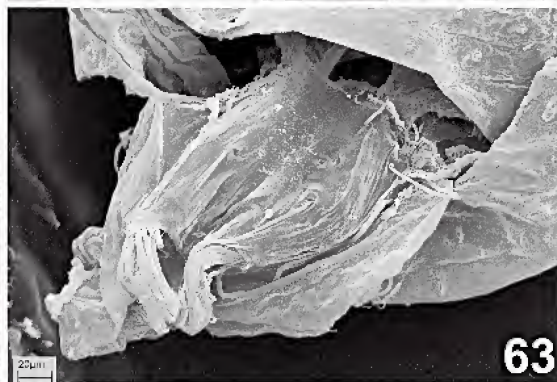
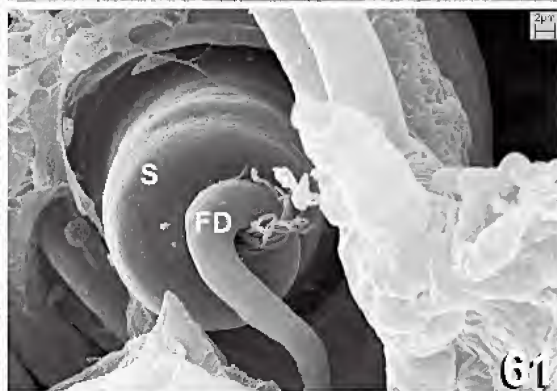
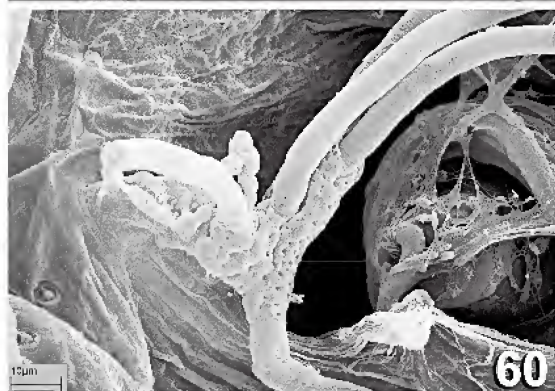
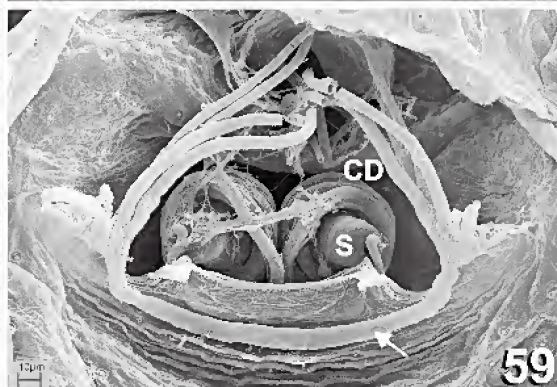




Figs. 50–55. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). **50–54**, Male right palp (inverted images), details. **50**, Detail of conductor, showing membranous cusps, and conductor ridge where embolus fits, prolateral view; **51**, embolar base, prolateral view; **52**, detail of conductor apophysis and palpal tibia; **53**, detail of retrolateral paracymbium (detail of fig. 47); **54**, detail cymbial tarsal organ, apical view; **55**, detail of epiandrous spigots (two) on epigastric furrow, arrow to one epiandrous spigot. Abbreviations: C, conductor; Cap, apophysis of conductor; CB, cymbium; E, embolus; EB, embolar base; P, paracymbium; Ti, tibia.

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Figs. 42–49. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). Male left palp (except noted). **42**, Prolateral view; **43**, prolateroventral view; **44**, ventral view; **45**, ventral-retrolateral view; **46**, retrolateral view (right palp, inverted); **47**, dorsal view (right palp, inverted) (see detail in fig. 53); **48**, dorsal view; **49**, apical view (right palp, inverted). Abbreviations: C, conductor; Cap, apophysis of conductor; CB, cymbium; E, embolus; EB, embolar base; P, paracymbium; Ti, tibia.



and the presence of two pits on the male palpal tibia were not found in *Cepheia longiseta*, further supporting the rejection of these characters as synapomorphic for Synsphyridae (see Lopardo et al., 2007).

Additional putative synsphyrid synapomorphies that seem to be present in both *Cepheia* and *Synsphyris* include extremely large and compressed male palp (as large as the cephalothorax) (figs. 2, 8); huge membranous conductor occupying most of the bulb, with a long groove where the embolus fits, and with a second process not involved with the embolus (Cap, figs. 42, 46); broadening in the diameter of spermatic duct before entering the base of the embolus (arrow in fig. 38); retention of at least one of the araneoid triplet spigots in the male PLS (fig. 37; see also Miller, 2007); absence of female palpal claw (fig. 12); a particular posterior tracheal arrangement, with wide spiracular opening consisting of two distant rounded openings exteriorly connected by thin ridge (figs. 30, 31) and two main tracheal bundles arising from a deep, flat, membranous atrium, anteriorly ending in sclerotized U-shaped duct, directing tracheoles anteriorly (figs. 58, 62, 63); and anterior booklungs reduced to tracheae (fig. 59; see also Miller, 2007).

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Figs. 56–63. *Cepheia longiseta* (Simon 1881), paralectotypes (MNHN-AR 1059). Female, respiratory system and genitalia. **56**, Epigynum and anterior tracheal spiracles; **57**, same, detail of epigynum and copulatory opening; **58**, digested abdomen, dorsal view; **59**, anterior tracheae and epigynum, arrow to “transverse duct”; **60**, same, detail on anterior left tracheal arrangement; **61**, same, detail on right spermatheca and fertilization duct; **62**, detail of posterior tracheae, a piece of cuticle is folded and covering the tracheoles bundles; **63**, same. Abbreviations: CD, copulatory ducts; FD, fertilization ducts; S, spermatheca.

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APPENDIX 1

ANATOMICAL ABBREVIATIONS

AC	aciniform gland	mt	metatarsus
ALE	anterior lateral eye(s)	n	nubbin
ALS	anterior lateral spinneret	P	paracymbium
AME	anterior median eye(s)	PI	piriform gland
C	conductor	PLE	posterior lateral eye(s)
Cap	apophysis of conductor	PLS	posterior lateral spinneret(s)
CB	cymbium	PME	posterior median eye(s)
CD	copulatory ducts	PMS	posterior median spinneret(s)
cs	chemosensory seta	S	spermatheca
CY	cylindrical gland	SD	spermatic duct
E	embolus	t	tartipore
EB	embolar base	T	tegulum
f	fundus	ta	tarsus
FD	fertilization ducts	TA	tegular apophysis
mAP	minor ampullate gland	Ti	tibia
MAP	major ampullate gland		

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